

NOTES ON THE GENUS CRASSULA

By VERA HIGGINS

In 1929, in the *Transactions of the Royal Society of South Africa*, Vol. XVII, Dr. Schonland published an important paper entitled *Materials for a Critical Revision of Crassulaceae (The South African Species of the genus Crassula L. (emend. Schonl.))*. This is still the standard work on the genus and new species described since this date have been fitted into the classification proposed by Schonland but, as is only to be expected in so large a genus—223 species are recognised in this paper—there are some errors and discrepancies to which attention has been drawn from time to time.

The following notes are designed to help clarify the position in the light of present knowledge and to indicate where further field work would be useful. The early literature on the subject is more readily available in Europe and knowledge of the type of change induced in plants grown under the unnatural conditions of a greenhouse helps in the interpretation of the early illustrations made from plants cultivated in Europe, but in cases of doubtful identification the final verdict must rest on investigations of the plants in their natural habitats.

When succulent plants from South Africa were first received in Europe early in the 18th century, they were grown under conditions that were too hot and too moist so that they tended to lose their original characteristics; the requirements of succulent plants in cultivation are now better understood and it is possible to keep them reasonably true to type by proper observation of the time and duration of the resting period required. In this way the plants can be studied at all stages of their annual life cycle and variants of species received from South Africa, whose native habitat is known and recorded, can be grown together and their behaviour compared. I have been growing *Crassulas* in this way for over twenty-five years, both those imported direct and others which have been long in cultivation. I may add that, to prevent possible hybridization, the plants have always been propagated vegetatively, never from seed.

The value of herbarium material is not underestimated but, for species described in the early days, there is little remaining; for instance, there are only 12 sheets of the *Crassulas* collected by Thunberg. Moreover, the very considerable variation that occurs, in some species particularly, is not indicated by a single herbarium specimen which may not have been typical of the colony of plants from which it was collected. When

the first *Crassulas* were named, the fixity of species was still an accepted principle of botany.

Crassulas have no economic uses nor are they of general horticultural interest but they are being increasingly grown by people who specialise in succulent plants and it is desirable that the nomenclature should be checked as far as possible and the range of variation in polymorphic species recognised.

The genus *Crassula* was first set up in 1732 by Dillenius in *Hortus Elthamensis*, where he described and figured seven species, one of which later proved to be *Portulacaria afra*. These species were adopted by Linnaeus who added 24 new names, ten in the first edition of *Species Plantarum* (1753), three in *Plantae rariorae africanae* (1760), four in the second edition of *Species Plantarum* (1763) and seven in *Mantissa* (1767—71).

In 1778 Carl Peter Thunberg, who collected in South Africa, described 28 new species in a paper published in *Nova Acta Acad. Caes. Natur. Cur.* VI, (1778). This paper, which is not well known, is of interest because the species are classified, as follows:

FOLIIS PETIOLATIS

1. cordata, 2. spatulata.

FOLIIS SESSILIBUS CONNATIS

- a. *Scapo subnudo*: 3. tecta, 4. hemisphaerica, 5. montana, 6. barbata, 7. cotyledonis, 8. tomentosa, 9. cephalophora, 10. spicata.
- β. *Caule foliis imbricatis tecto*: 11. deltoidea, 12. corallina, 13. vestita, 14. columnaris, 15. pyramidalis, 16. alpestris, 17. turrita, 18. rupestris, 19. argentea.
- γ. *Caule foliis sparsis remotioribus*
 - a. *Foliis planis*: 20. retroflexa, 21. perforata, 22. thyrsiflora, 23. capitella, 24. crenulata.
 - β. *Foliis teretibus vel triquetris*: 25. pubescens, 26. mollis, 27. ramosa, 28. adscendens.

A description of each species is given and two of them, *Cr. pyramidalis* and *Cr. alpestris*, are illustrated; *Cr. adscendens* was, apparently, never referred to again by Thunberg.

In 1794, in *Prodrromus Plantarum Capensis*, Thunberg described 11 more new species that he had collected during his sojourn at the Cape from 1772—1775 and in his *Flora Capensis* (1825), edited by Schultes, another two species were described so that, in all, Thunberg added 40 species to the genus *Crassula*. Of these, at least 27 still bear the name he gave them and are species known and recognised to-day.

Early in the 19th century, A. H. Haworth in England, Ecklon and

Zeyher and others in South Africa added to the number of species described so that when Harvey published his account of the genus in *Flora Capensis* II (1862), he was able to include 99 species to which he added 10 names of "Species of Section *Globulea* unknown to us" and 35 names of "Doubtful Species of Section *Eu-Crassula* and species unknown to us."

Since Harvey's time the number of *Crassula* species known has increased considerably and there are probably still a number which have not yet been determined; the fact that many of them show a considerable range of variation in nature makes it important that more field work should be carried out in connection with this genus. It is unfortunate that a number of the species have been described from cultivated plants, without knowledge of or comparison with material from their native habitats. The object of these notes is to scrutinise some of the names which appear to be doubtful and to put in a plea for further examination in the field. The classification given by Schonland will be used as the basis of discussion.

SECTION III. STELLATAE

ARBORESCENS GROUP

In this Group Schonland recognised two species: *Crassula arborescens* and *Cr. argentea*.

Crassula arborescens (Mill.) Willd.

As synonym *Cr. cotyledon* Jacq. is cited and the suggestion made that perhaps Jacquin's name should have priority, but this is not so. The plant was first described by Phillip Miller in 1768 as *Cotyledon arborescens* but had not at that time flowered in England though it had been in cultivation for 30 years. Jacquin, in 1781, described and illustrated the same plant under the name *Crassula cotyledon* since, after he had had it in cultivation for 25 years, it produced flowers in 1778 and these showed that it belonged to the genus *Crassula*. The specific name given by Miller has priority over that given by Jacquin 13 years later.

In the British Museum is a type specimen labelled "*Crassula*, nova species exist. in Miscell. *Crassula Cotyledon* Jacq. Miscell. ii. 295. t. 19! (1781)", and on the back "Hort. Vindob. Jacquin". There is also another specimen, consisting of two bits of inflorescence and three leaves, labelled "*Crassula arborescens* (Cotyledon)"; below in pencil is written "*Crassula* . . . an *argentea* Linn. Suppl." and on the back "Hort. Florent. 1780".

The illustration in the Botanical Magazine t. 384 is taken from a plant which flowered at Chelsea Garden in 1797, probably for the first time in England since neither Miller nor Aiton saw this species in flower.

In *The Flora of South Africa* Marloth gives a good habitat photograph of the plant growing in the Karroo near Laingsburg.

In cultivation in England *Cr. arborescens* flowers very rarely; the plant grows well but is less compact than in nature and the leaves tend to be larger but keep their silvery colour and purple edge. It has a curious habit of dropping short branches which take root if they fall on a suitable medium.

***Crassula argentea* Thunb.**

Under this name Schonland has placed *Cr. portulacea* Lam. and *Cr. obliqua* Ait. after having examined the type specimen of *Cr. argentea* Thunb. at Uppsala; I have only seen a photograph of this but I am inclined to doubt Schonland's identification, especially as he himself has said (l.c. p. 201) that the two species (*Cr. arborescens* (Mill.) Willd. and *Cr. portulacea* Lam.) "are easily distinguished when alive, though with dried specimens it is sometimes difficult". Thunberg's specimen of *Cr. argentea* consists of a stout stem, topped by a corymbose inflorescence and bearing only one pair of leaves; one leaf appears to be twisted, and the other is about as broad as long. I have dried leaves of *Cr. arborescens* and *Cr. portulacea* under similar conditions and find that, whilst *Cr. arborescens* more or less retains the broad, ovate shape, in *Cr. portulacea* the leaves become markedly narrower in proportion to their length. In fact, Thunberg's specimen more nearly resembles *Cr. arborescens* than *Cr. portulacea*. The note pencilled on a herbarium sheet at the British Museum, referred to above, "an *argentea* Linn. Suppl." suggests that some earlier worker regarded *Cr. arborescens* as synonymous with *Cr. argentea* Thunb., not with *Cr. portulacea* Lam.

The name *Cr. argentea* was first published by Thunberg in 1778 (*Nova Acta Acad. Caes. Natur. Cur.* VI) and placed by him in his classification under the heading β *Caule foliis imbricatis tecto*, next to *Cr. rupestris*; the brief descriptions of the two plants differ only in the word "glabris" used to describe the leaves of *Cr. rupestris* and "argenteis" those of *Cr. argentea*, so that clearly Thunberg was describing a plant with silvery leaves. Thunberg's specimen of *Cr. argentea* was taken from a plant growing in the Dutch East India Society's Garden in Cape Town and Rondebosch; he does not appear to have found it in the wild; this would not be unlikely if his plant is the same as *Cr. arborescens* which has a very localised distribution. In fact, Schonland in 1902, when describing *Cr. nitida* says that "*Cr. arborescens* is not known in the wild though common in cultivation". It was found again by Mr. Pillans and its distribution is now known.

The name *Cr. argentea* was adopted by Linnaeus and repeated in

later botanical works but the identification of the plant intended is uncertain. Harvey lists it amongst his "Species unknown to us" and suggests that it may be *Cr. lactea* which is unlikely since Thunberg was also responsible for the description of *Cr. lactea* at a later date. J. G. Baker (*Journ. Bot.* 1897, p. 484) regarded it as *Cr. falcata*. In commenting on Schonland's paper, Eric Walther in *The Cactus and Succulent Journal of America* II, Pt. I, 1930, referring to *Cr. argentea* Thunb. as a synonym of the familiar *Cr. portulacea* Lam. says: "Schonland states that Thunberg's material is unmistakably this species but fails to account for Baker's considering this synonymous with *Cr. falcata*; and in fact a better example of a misapplied name it would be hard to find."

Since the name *Cr. argentea* Thunb. had fallen into disuse and is now uncertain in its application, it would be desirable to disregard it and revert to Lamarck's *Cr. portulacea*, with which is associated Aiton's *Cr. obliqua*.

***Crassula portulacea* Lam. and *Cr. obliqua* Ait.**

Crassula portulacea was described by Lamarck (*Encyclopédie* II, 172) in 1786 from plants which had been growing for some years in the Jardin du Roi at Paris; he said that it was believed to come from Africa. *Crassula obliqua* was described three years later in Aiton's *Hortus Kewensis*, Ed. 1, by Solander, the plant having been brought from the Cape of Good Hope by Masson who found it in the gardens at Rondebosch; it was considered as synonymous with *Cotyledon ovata* Mill., first described (without flowers) in Miller's *Gardeners' Dictionary*; the plant had been sent to him by Dr. Adrian van Royen of Leyden who had received it from the Cape of Good Hope. In the 2nd edition of *Hortus Kewensis* *Cr. portulacea* Lam is also given as a synonym of *Cr. obliqua* Ait. and in Desfontaine's *Tableau de l'Ecole de Botanique du Museum d'Histoire Naturelle*, 1804, *Cr. portulacea* and *Cr. obliqua* are regarded as synonymous.

Although Lamarck's description of *Cr. portulacea* (1786) antedates Solander's description of *Cr. obliqua* (1789) by three years, Haworth uses the latter name, regarding the former as the synonym. It is interesting that in his *Rev. Pl. Succ.* (1821) Haworth gives a variety *Cr. obliqua* β *rufo-cincta* which differs chiefly in having red edges to the leaves. Since *Cr. portulacea* was not described until it had been in cultivation for some years and, in those days, most succulent plants were grown under conditions that were too hot, too moist and often too shady, it is quite probable that the red edge to the leaf, characteristic of the plant in nature, may have been lost. Haworth, on the other hand, grew succulent plants under much better conditions which may account for his red-edged variety;

he does not say where it came from, but as he says it is "subtrientalis", that is, less than four inches, it may have been a seedling and, as he suggests, a distinct species. This is the first mention of the red edge so characteristic of *Cr. portulacea* in the wild and, usually, in cultivation now.

Harvey in *Flora Capensis* regards *Cr. portulacea* Lam. as the type and gives *Cr. obliqua* Ait. as a synonym.

The earliest illustration is in De Candolle's *Plantes Grasses*, t. 79 (1801); this was called *Cr. portulacea* and was drawn from plants in the Jardin du Roi, possibly the same stock from which Lamarek drew up his description; it shows a plant with pale leaves, slightly pointed and is not typical of the plant known to-day in the wild which normally has blunter apices to the leaves.

In *Das Kapland* (1908) Marloth gives two photographs (Plates 14 and 16) which show the plant in its habitat but since he states that the plants "with their thick stems and large, white-farinose, fleshy leaves make whole cliffs look whitish from a distance" it is obvious that he is referring, not to *Cr. portulacea* but to *Cr. arborescens* and, indeed, a similar habitat photograph is given in his *Flora of South Africa* (1924), under the name *Cr. arborescens*.

In 1918 G. V. Nash published a description of *Cr. portulacea* in *Addisonia* III, accompanied by a colour plate, t. 109, which was taken from a plant growing in the New York Botanic Gardens; it shows the characteristic shining green leaves with red edges. The same plant is illustrated in *Flowering Plants of South Africa* 7.156 (1924) and in each case *Cr. obliqua* Ait. is given as a synonym. As far as I can discover Schonland in 1929 was the first person to suggest that *Cr. portulacea* Lam. was synonymous with *Cr. argentea* Thunb.

At the present time there are a number of varieties in cultivation, most of which appear to be of recent and unknown origin. As far as I can learn this species does not vary greatly in the wild but for many years there have been two distinct plants grown in Europe; one, with shining green leaves that have red edges, is called *Cr. portulacea* and a paler variety whose leaves, even in full sun, rarely show any reddening, is generally called *Cr. obliqua*. There is a horticultural distinction between these plants in that *Cr. portulacea* flowers well in England when large enough but *Cr. obliqua* has not been known to flower here; the latter has the curious habit of dropping short branches in the same way as does *Cr. arborescens*; when kept dry or starved the oblique position of the leaves becomes more obvious.

Through the kindness of M. Vatrican, Director of the Jardin Exotique at Monaco, I have had the opportunity of seeing all three plants in flower, for in southern Europe there is not the same difficulty in flowering them

as in our more northern climate. The flowers are very similar but there are distinctions between them, as shown in the accompanying illustration (Fig. 1.). The chief differences are in the length of the calyx lobes and in the shape of the carpels; in both the styles are long and slender but the ovaries in *Cr. portulacea* are slender and slightly curved so that they stand close together whilst in *Cr. obliqua* the ovaries are gibbous below the styles which prevents the styles from touching. Also in *Cr. portulacea* the petals are wide-spread, at least to the horizontal position, whilst in *Cr. obliqua* they do not spread so widely. Comparison with the flower of *Cr. arborescens* shows that, in the length of the calyx lobes, position of the petals and shape of the ovary, the flower of *Cr. obliqua* agrees more closely than does that of *Cr. portulacea*.

The type specimen of *Crassula obliqua* Soland. in Aiton's *Hortus Kewensis*, which is in the British Museum, has rounded leaves like those of *Cr. portulacea* though occasionally slightly pointed tips occur. Since authorities who handled the plants alive—Lamarck, Solander and other contemporary botanists—regarded these two names as synonymous, I think this can be accepted as a fact. The illustration in *Plantes Grasses* t.79 was not published until 17 years after Lamarck's description; one cannot assume that it was from the same stock or, even if it was, that it had been vegetatively propagated; it might have been raised from seed which makes the chance of hybridisation a possibility.

The plant now known in cultivation as *Cr. obliqua* is not known to have been collected in the wild nor has it been found in South Africa, but descendants of plants grown 100—150 years ago, vegetatively reproduced, can still be found in European collections to-day. Possibly *Cr. 'obliqua'* of gardens is a descendant of the stock from which De Candelolle's illustration was made.

One other name needs consideration, *Crassula nitida* Schonl., described in *Records of the Albany Museum* 1.54 (1903); at the time Schonland regarded this plant as a new species and gave a comparison with *Cr. Cotyledon* L. and *Cr. portulacea* Lam. Later, however, he decided that it was not sufficiently distinct and regarded it as a synonym of *Cr. portulacea* Lam.; from the description it certainly sounds like the common form of *Cr. portulacea* as known in cultivation in Europe. The amount of variation in this species is not known but a number of new variants are beginning to appear; their origin is uncertain but some have certainly originated in gardens both in Europe and in South Africa. Such plants, if distinct enough to merit a new name, should be given a cultivar name.

Conclusion: The identity of *Cr. argentea* Thunb. is uncertain and this name should, therefore, be dropped. Contemporary authorities who knew

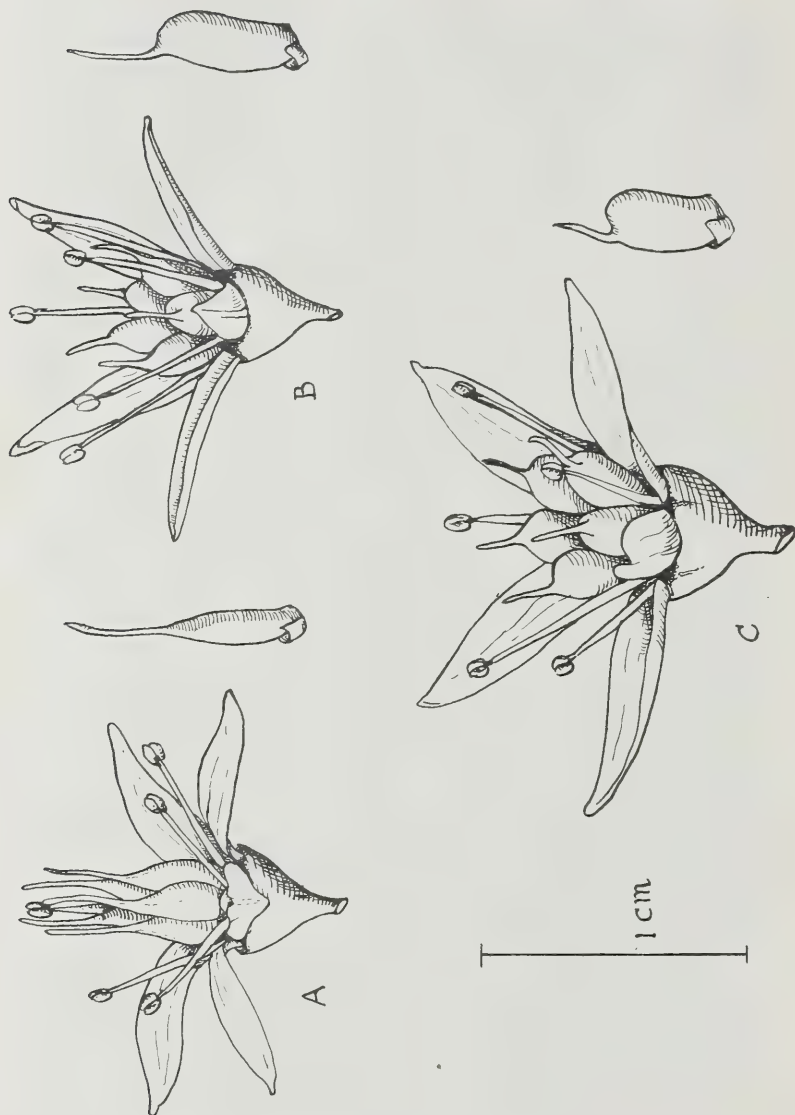


FIG. 1. A. *Crassula portulacea* Lam.; B. *Cr. portulacea* Lam. var. *obliqua* Ait.;
Cr. arborescens (Mill.) Willd.

the plant in cultivation in Europe considered *Cr. portulacea* Lam. (1786) and *Cr. obliqua* Ait (1789) to be synonymous; the older name therefore has priority. The form in cultivation usually known as *Cr. obliqua* may or may not be the *Cr. obliqua* of Aiton, described by Solander; since this form is not apparently known wild in South Africa it is best regarded as a variety, *Cr. portulacea* Lam. var. *obliqua* Ait. The newer variants of garden origin in Europe and South Africa which have come into cultivation in recent years should, if sufficiently distinct, be given cultivar names.

SECTION I. TILLAEOIDAEAE

CORALLINA GROUP

As synonyms of *Crassula corallina* Thunb. Schonland gives *Cr. dasyphylla* Harv. and *Cr. simiana* Schonl. That this view is not fully accepted is indicated by the fact that two plants in cultivation to-day are known as *Cr. corallina* and *Cr. simiana*, their habit and mode of growth alone making it obvious that the plants are not identical. *Cr. "corallina"* has been in cultivation for some considerable time but *Cr. "simiana"*, a much more compact plant with short, erect stems, is of more recent introduction. The distribution of these two plants in the wild is different and investigation of the early descriptions and of herbarium specimens confirm that there are two distinct plants from distinct areas but the correct names are *Cr. corallina* Thunb. for the plant from the western districts (in cultivation now called *Cr. simiana*) and *Cr. dasyphylla* Harv. for the one from the east (in cultivation called *Cr. corallina*).

Cr. corallina was described by Thunberg who found it in dry fields at Hantam between Daunis and Roggeveldsberg; the plant has a fusiform root from which arise a number of erect stems about an inch high, the very fleshy, close-packed leaves covered in the upper half with white wax. *Crassula dasyphylla* was described by Harvey from two collectings, one made by Drège at Winterveld (between Victoria West and Richmond), the other by Zeyher at Cradock. No mention is made of the roots but the stems are prostrate, about 3—4 inches long, with fleshy leaves at short intervals. Harvey adds, however, that fragments "of a nearly similar but stronger plant was gathered by Zeyher at Bitterfontein; they differ from Zeyher's plant above quoted in having a large woody root and somewhat larger leaves, but are too imperfect for description;" but he did not identify this "stronger plant" with *Cr. corallina* Thunb. which he placed in his list of "Species unknown to us". This observation of Harvey's is the clue to the confusion; the "stronger plant" has been re-discovered and is in cultivation to-day, but under the name *Cr. simiana*, Schonl.; the name *Cr. corallina* has long been in use for the prostrate plant.

Crassula simiana was described by Schonland in 1897 from a plant received from "Stormberg" but later he writes (*Ann. Bolus Herb.* (1918) II. 75): "I am quite satisfied that my *Cr. simiana* cannot be specifically separated from *Cr. corallina*". Later again, in Report 12 of the Percy Sladen Memorial Expeditions (*Ann. Bolus Herb.* IX) he says of a plant from Richtersveldt "that there can hardly be any doubt that this is Thunberg's plant which was meant by Harvey as his *Cr. dasyphylla*. It seems however that the latter also included a species from the eastern parts of Cape Colony which is perhaps distinct, though closely allied, and which I have described as *Cr. simiana*." But Harvey was describing a plant from Winterveld and definitely rules out Zeyher's "stronger plant" from Bitterfontein, so that *Cr. simiana* Schon. is a synonym of *Cr. dasyphylla* Harv.

Herbarium material of so small and fragile a plant is not easy to determine; many of the specimens are broken, rather scrappy and without roots or flowers. In the British Museum is a specimen labelled: "*Cr. corallina* (Nov. Act. N.C. 6. p.334)" and on the back: "Prom. b. spei. Fr. Masson (Solander)" which was probably of the same collecting as the plant described by Thunberg since he and Masson collected together in South Africa. This specimen has several short stems arranged fan-wise from a common base and, though no root is present, it strongly suggests the thong-rooted plant, not Harvey's species with weak, prostrate stems. A note on this sheet alters the name to *Cr. dasyphylla* Harv. "see Journ. Bot. 1897. p.480.", so that this was the specimen which James Britten and E. G. Baker examined and considered identical with *Cr. dasyphylla* Harv.

Dinter, in 1914, gave an excellent illustration (*Neue und wenig bekannte Pflanzen Deutsch-Südwest-Afrikas*, Fig. 51) of a *Crassula* "Dtr. 3243" found at Klein-Karas which Schonland considered to be *Cr. corallina* Thunb. but later in 1928 (*Sukkulantenforschung in Südwestafrika* II, p. 94) Dinter himself considered it to be a distinct species, perhaps the one that Schonland had named *Cr. simiana*; he was regarding *Cr. corallina* Thunb. and *Cr. dasyphylla* Harv. as synonymous and thought that two species existed. In fact Dinter's plant was a re-discovery of *Cr. corallina* Thunb.

If the herbarium specimens at Kew and the British Museum are sorted according to the habit of the plants it will be found that those which represent *Cr. corallina* Thunb. come from such places as Hantam, Bitterfontein, Aus and Warmbad, that is the dry desert areas of the south west and Namaqualand, whilst those with the prostrate stems rooting at the nodes come from Winterveld, Cradock and Gamka River, Stormburg and Prieska, that is further east in a less arid climate. Emphasis

has been laid on the habit of the plants since this is more readily observed, especially in dried specimens, but there are also considerable differences in the flowers, as shown in Fig. 2 and in the table below; the details are

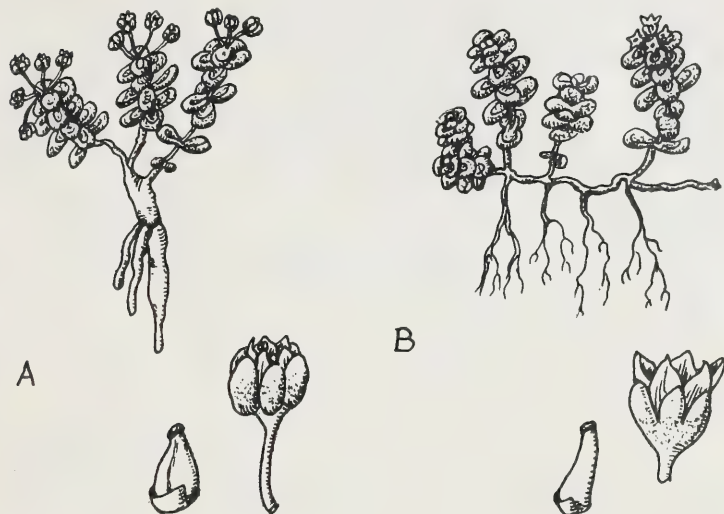


FIG. 2. A. *Crassula corallina* Thunb. (syn. *Cr. "simiana"* hort.); B. *Cr. dasyphylla* Harv. (syn. *Cr. simiana* Schönl.; *Cr. "corallina"* hort.). Plants nat. size.

taken from specimens received from Steinkopf and Springbok as *Cr. simiana*, and from the Steytleville district as *Cr. corallina*. The plants were grown here for several years and changed very little from the condition in which they arrived except that, during one sunless autumn, when *Cr. corallina* Thunb. (*Cr. "simiana"*) became greener but remained compact whilst both the stems and leaves of *Cr. dasyphylla* Harv. (*Cr. "corallina"*) elongated considerably.

Cr. corallina Thunb.

Root:	fusiform
Stems:	erect, about 2·5 cm
Pedicels:	2—3 times longer than sepals
Sepals:	very thick, obtuse, upper half with white wax
Petals:	ivory white, firm, incurved or erect
Carpels:	short, broad, style very short
Squamæ:	large, greenish white

Cr. dasyphylla Harv.

	fibrous, also from the nodes
	prostrate, 7·5—10 cm
	equal to sepals
	thinner, more pointed, tips white
	greenish white, thin, recurved
	short, more slender, style longer
	smaller, bright yellow

It would appear, therefore, that the species occurring in S.W. Africa is *Cr. corallina* Thunb. and the species common in East Cape Province is *Cr. dasyphylla* Harv. It is noteworthy that Thunberg emphasised the white wax on the leaves of his plant, which he likened to a marine coral. Harvey, on the other hand, named his plant for its likeness to *Sedum dasyphyllum*. In his description he does not mention the white wax on the tips of the leaves which is apt to disappear, both in nature and in cultivation, if the plant is growing under moist conditions. Schonland likened his *Cr. simiana* to *Sedum geminum* and does not mention white tips in the Latin description but says: "the upper part of the younger leaves is covered with granular wax arranged in a reticulate manner".

Conclusion: *Crassula corallina* Thunb. (syn. *Cr. "simiana"* hort.) and *Crassula dasyphylla* Harv. (syn. *Cr. simiana* Schonl.; *Cr. "corallina"* hort.) are two distinct species.